CLAIMS

1. An information recording medium comprising a substrate and a recording material layer formed on the substrate, the recording material layer undergoing reversible phase change between electrically or optically detectable states by electric energy or by electromagnetic energy, wherein

the recording material layer comprises a material selected from a material 'A' having a crystal structure comprising a lattice defect in one phase of the reversible phase change; or a material 'B' in a complex phase composed of a crystal portion comprising a lattice defect and an amorphous portion in one phase of the reversible phase change, and the crystal portion and the amorphous portion comprise a common element; and

at least a part of the lattice defect is filled with an element other than an element constituting the crystal structure.

2. The information recording medium according to claim 1, wherein a molar ratio of the amorphous portion to the crystalline portion in the complex phase of the material 'B' is 2.0 at most.

3. The information recording medium according to claim 1, wherein the reversible phase change of the material 'B' occurs between the complex phase and a single phase.

4. The information recording medium according to claim 1, wherein the crystal structure comprising the lattice defect is a NaCl type.

5. The information recording medium according to claim 1, wherein the crystal structure comprising the lattice defect comprises Te or Se.

6. The information recording medium according to claim 1, wherein the amorphous phase portion composing the complex phase of the material 'B' comprises at least one element selected from Sb, Bi, Ge and In.

7. The information recording medium according to claim 1, wherein the crystal structure comprising the lattice defect comprises Ge, Sb and Te.

8. The information recording medium according to claim 1, wherein the

crystal structure comprising the lattice defect comprises at least one element selected from Ge, Sb, Bi and Te, and the amorphous component in the complex phase comprises at least one element selected from Ge, Sb and Bi.

9. The information recording medium according to claim 7, wherein the crystal structure comprising the lattice defect further comprises at least one element selected from Sn, Cr, Mn, Ag, Al, Pb, In and Se.

10. The information recording medium according to claim 9, wherein the crystal structure comprising the lattice defect further comprises at least one combination of elements selected from Sn-Cr, Sn-Mn, Sn-Ag, Mn-Ag, Cr-Ag, Sn-Mn, and Sn-Cr-Ag.

11. The information recording medium according to claim 1, wherein the element to fill at least a part of the lattice defect forms a stoichiometric rock-salt type crystal that is stable with respect to Te.

12. The information recording medium according to claim 1, satisfying a relationship represented by $0.7\ Rnc < Rim \leq 1.05\ Rnc$, where Rim denotes an ionic radius of an element filling at least a part of the lattice defect, and Rnc denotes a minimum value of an ionic radius of an element constituting the crystal structure.

13. The information recording medium according to claim 1, satisfying a relationship represented by $|Tim - Tnc| \leq 100°C$ where Tim denotes a melting point of an element filling at least a part of the lattice defect, and Tnc denotes a melting point of a crystal constituting the crystal structure.

14. The information recording medium according to claim 1, satisfying a relationship represented by $0.7\ Rnc < Rim \leq 1.05\ Rnc$ and $|Tim - Tnc| \leq 100°C$, where Rim denotes an ionic radius of an element filling at least one part of the lattice defect, Tim denotes the melting point, Rnc denotes a minimum value of an ionic radius of an element constituting the crystal structure, and Tnc denotes the melting point.

15. The information recording medium according to claim 1, satisfying a relationship represented by $Dim \leq Ddf \times 1.5$, where Dim denotes a

concentration of an element added to fill the lattice defect, and Ddf denotes a concentration of the lattice defect in the crystal structure.

16. The information recording medium according to claim 15, wherein the Dim satisfies a relationship represented by $0.2 \leq Dim \leq Ddf$.

17. The information recording medium according to claim 11, wherein the element to fill the lattice defect is at least one element selected from Ag, Sn and Pb.

18. The information recording medium according to claim 11, wherein the crystal structure comprising the lattice defect is at least a group of elements selected from a $GeTe\text{-}Sb_2Te_3$ quasibinary system composition, a $GeTe\text{-}Bi_2Te_3$ quasibinary system composition, and a $GeTe\text{-}Al_2Te_3$ quasibinary system composition.

19. The information recording medium according to claim 18, wherein the element to fill the lattice defect is Al.

20. The information recording medium according to claim 18, wherein the crystal structure comprising the lattice defect comprises $(GeTe)_{(1-x)}(M_2Te_3)_x$ where M denotes an element selected from Sb, Bi, Al, and an arbitrary mixture of Sb, Bi, and Al; and x satisfies $0.2 \leq x \leq 0.9$.

21. The information recording medium according to claim 20, wherein x satisfies $0.5 \leq x \leq 0.9$.

22. The information recording medium according to claim 1, further comprising N in the recording film.

23. The information recording medium according to claim 22, wherein a concentration Dn of the N atom (atom%) is in a range of $0.5 \leq Dn \leq 5$.

24. A method for manufacturing an information recording medium having a recording material layer on a substrate, where reversible phase change between electrically or optically detectable states is caused by electric energy or electromagnetic energy, wherein

the recording layer is formed by using a recording material in which one phase of the reversible phase change comprises a lattice defect, and at least a part of the defect is filled with an additional element.

25. The method for manufacturing an information recording medium according to claim 24, wherein after formation of the recording layer an element comprising the crystal lattice is deposited outside the lattice by the additional element.

26. The method for manufacturing an information recording medium according to claim 24, wherein the recording layer is formed by sputtering, and a sputtering target used in the sputtering comprises an element constituting the crystal structure and the additional element.

27. The method for manufacturing an information recording medium according to claim 26, wherein a gas used in the sputtering comprises at least one gas selected from N_2 gas and O_2 gas.